Amendments to the Drawings

In response to the objection taken to the drawings, textual labels have been added to non-obvious block diagram components in Figures 1 and 2. Corrected drawing sheets are attached as a Substitute Sheet for Figure 1 and a Substitute Sheet for Figure 2, with both drawings now being in condition for acceptance.

REMARKS

Reconsideration and allowance of the above-identified claims is respectfully requested. Claims 1-14 are now pending, wherein claim 9 is original, claims 1-8 are amended and claims 10-14 are newly added. In view of the following remarks, Applicant submits that the claims are allowable at this time.

Applicant thanks Examiner Deschere and SPE Sircus for the Interview conducted at the Patent Office on December 12, 2006.

Claims 1 and 5 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite based on insufficient antecedent basis for the limitation "vehicle management" as used in these two claims. Applicant understands this to refer to the format of the phrase' use in the two claims, and appropriate claim amendments have been made to overcome this rejection.

Claims 1, 5 and 9 were rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps. The allegedly omitted essential steps, as understood from the Office Action at page 3, first paragraph, is first that the method as claimed does not recite the voltage and torque reference variables as each having tolerance bands, and secondly that both variables are claimed as being independent. These two items, the Examiner finds, omit

essential steps so to make the claims incomplete. Applicant respectfully disagrees as to both grounds for this rejection, as discussed further hereinbelow.

Claims 1, 5 and 9 stand rejected under 35 U.S.C. 102(b) as anticipated by US 6,504,327 (Omata). Dependent claims 2-4 and 6-8 stand rejected as obvious under 35 U.S.C. 103(a) in view of Omata in combination with US 6,324,460 (Lehmer).

Reconsideration and allowance of the above-identified claims are respectfully requested in view of the clarifying amendments and remarks provided below.

Discussion

As to the four independent claims presented, claim 1 is an apparatus claim for a vehicle control device and claim 5 is a corresponding method claim for a method for controlling an electric machine on a vehicle. Claim 9 is a second method claim for operating an electric machine, and claim 10 is an apparatus claim for an improvement in a device for control of an electrical and a propulsion system of a motor vehicle. One aspect of the invention is the interdependency of the control provided to the power supply system and to the propulsion system of a vehicle. One embodiment of the invention teaches its use in a hybrid vehicle where the propulsion comes from both a combustion engine and an electric motor (being the "electric machine" functioning as a motor in a propulsion mode).

A problem solved by the invention is the creation of an adverse condition on one of the two systems due to operation of the other system, e.g. a loss of driving power or torque, or rough shifts, when the power supply system is being heavily used; or a flickering of lights or performance reduction of other electrically-power functions operated by the operator who is managing the vehicle ("vehicle management") due to heavy exertion on the propulsion system. Accordingly, both the control device and the methods for controlling are described and claimed setting forth interdependent variable reference signals according to the invention, each of which is bounded by upper and lower limits within which it can vary. These upper and lower limits define an operating range, or tolerance band for each variable, i.e. for the voltage reference variable and for the torque reference variable. Furthermore, since each tolerance band for one variable is defined by minimum and maximum values of the other variable, the dependency of the operational values from one system in limiting the range of operation of the other system is clear.

As regards the rejection of claims 1, 5 and 9 under 35 U.S.C. 112, second paragraph, "as being incomplete for missing essential steps," the alleged incompleteness as Applicant understands it (Office Action at page 3, top paragraph) is due to both variables being claimed as independent and secondly, due to there allegedly being "no single disclosed method" where both the voltage

and torque reference variables have tolerance bands. Applicant respectfully disagrees and offers the following in support thereof.

Reference to the appropriate limitations recited in each of the three claims points out both the inter-dependency of the variables, and each being bounded by a tolerance band defined by the other variable.

With respect to claim 1, changes in the voltage reference variable are required to be confined to predetermined minimum and maximum limit values: "...changes in the voltage reference variable...downwards and upwards are limited by predetermined torque limit values...which define a torque tolerance band..." (claim 1, application page 38, lines 3-6). Likewise with the torque reference variable the band limiting wording is as follows: "...changes in the torque reference variable upwards and downwards are limited by predetermined voltage limit values...which form a voltage tolerance band..." (claim 1, application page 38, lines 6-9). The interdependence between the voltage and torque controls is inherent where a range of a voltage reference variable is claimed that is limited by a tolerance band defined by torque values, and likewise, a range of a torque reference variable is claimed that is limited by a tolerance band defined by minimum and maximum voltage limit values. Each variable is, therefore, not claimed as being independent but to the contrary, is claimed as being dependent on the tolerance band as defined by the other

variable, a key distinction from the Omata patent relied on in the Office Action where independent control is emphasized (See, e.g., Abstract of U.S. 6,504,327).

With respect to claim 5, it presents a method corresponding to the use of a controlled device using language that tracks to a certain extent that of apparatus claim 1. In claim 5, the act of controlling requires that changes in the voltage reference variable be limited by predetermined torque limit values: "...changes in the voltage reference variable...downwards and upwards are limited by predetermined torque limit values...which define a torque tolerance band..." (claim 5, application page 40, second full paragraph); and, "changes in the torque reference variable... are limited by predetermined voltage limit values...which form a voltage tolerance band...". *Id.* The interdependency between control of a voltage and control of a torque is inherent by the fact that the reference variable of one is limited by a tolerance band defined by minimum and maximum values of the other, as discussed with respect to claim 1.

Independent method claim 9 also claims both variables as being dependent and claims both the voltage and the torque reference variables as each having tolerance bands, as evidence by the following language:

> "limiting the voltage reference variable by upper and lower torque limit values which must not be overshot or undershot in an event of changes to the voltage reference variables; and

> limiting the torque reference variable by voltage limit values which must not be overshot or undershot in an event of torque changes;..."

(claim 9, application page 42).

With it thus shown that both variables are limited in claims 1, 5 and 9 to being dependent on a tolerance band defined by values of the other, and with claim 5 reciting a single disclosed method in which both the voltage and torque reference variables do have tolerance bands, the withdrawal of this rejection is earnestly requested.

Turning next to the reliance on US 6,504,327 to Omata in rejecting claims 1, 5 and 9, applicant states that the disclosure in Omata is substantially different and patentably distinguishable from the inventions as claimed. Omata shows a control apparatus consisting of an engine control and a motor control as used in a hybrid vehicle propelled by the combination of an internal combustion engine and an electric motor. The motor control device is independent of the engine control device and controls both the driving and power-generating states of the motor. It does this by detecting the open-circuit battery voltage in a drive stop condition, and uses this value to set upper and lower voltage limits for motor driving as a function of the open-circuit voltage. The benefit is that an over-charge and an over-discharge of the battery are prevented by the Omata control device which increases the life of the battery, i.e., it is designed to improve battery life by not letting the battery discharge to less than a

predetermined voltage (preventing over-discharge) and charges the battery only when it is below a predetermined voltage (preventing over-charge), so to extend the battery's life.

In contrast, the present invention describes and claims a control device for both the electrical system and the propulsion system of a motor vehicle in which control of the electrical system is limited by a torque band and control of the torque (propulsion) system is limited by a voltage band. The control device produces a variable reference voltage (a charging voltage) for controlling the "electrical machine" (EM), when used as a power generator. This control is a function of specifics of the vehicle's operation by the user (i.e., "signals from vehicle management") which impose varying electrical power requirements on the vehicle's power supply system at any given time. The range of the variable reference (expressed in voltage) is limited by minimum and maximum torque values on the engine that form a limiting torque band.

For example, operation of "the vehicle internal lighting, the vehicle external lighting, the windscreen wipers, air conditioning, refrigeration or refrigerated compartment, navigation system, television and similar electrical devices or appliances which can be used in a vehicle" (specification page 11, 2nd line from bottom, to page 12, line 2) all impose demands on the vehicle's power supply system. These options are controlled or managed by the vehicle's operator or driver which gives rise to, and supports, use of the phrase "vehicle

management" in the application, with these various functions under management of the driver given as examples of management of the vehicle.

In response to the vehicle system demands, the inventive control device produces a torque reference variable (expressed in terms of voltage) that controls the "electrical machine" ("EM") as a function of the positive or negative torque requirement of the propulsion system at any given time. This torque reference (signal) is bounded by or limited predetermined torque limit values for the electrical machine, which form the torque tolerance band (voltage being the variable for setting the torque limits).

Operation of the EM in its propulsion mode as a motor is controlled by a variable reference torque bounded by voltage limits that form a voltage tolerance band. The reference torque signal can change so to change the torque output of the EM, so long as it satisfies two conditions: (1) it remains within the defined voltage tolerance band, and (2) the torque value demanded from the motor by the torque reference variable is NOT the same as the predetermined motor torque required to produce the charging voltage (variable reference voltage).

The control device automatically cyclically checks the reference variables, being voltage for the torque band setting and torque for the current or electrical power band setting.

Thus unlike Omata where the engine control and the motor control are independent of one another, the present invention's control device links the two controls so to make one's operation dependent on the other, and not independent as taught in Omata. In addition to this dependency being claimed in the control device apparatus of independent claim 1, it is also claimed in the corresponding limiting steps of method claim 5 by the following wording regarding the torque control being limited by voltage:

> "... changes in the torque reference variable upwards and downwards are limited by predetermined voltage limit values..."

Application at page 40, lines 8-7 from bottom.

And similarly as regards the voltage control being limited by torque:

> "... changes in the voltage reference variable downwards and upwards are limited by predetermined torque limit values for the electrical machine which define a torque tolerance band."

Application page 40, lines 12-9 from bottom.

The invention's control device thus (1) controls torque output of the EM within torque limits set by minimum and maximum voltages; and (2) controls charging and voltage output within voltage limits set by minimum and maximum torque settings (of the EM shaft). Control of the vehicle power system (EM as a generator) and the vehicle propulsion system (EM as a motor) are thus

interrelated and dependent (since torque limits are set by voltage settings, and charge or voltage limits are set by torque settings).

Independent claims 1, 5 and 9, as amended, define this dependency and clearly distinguish the claimed invention from Omata, which basically uses the measurement of an open-circuit voltage in a drive-stop condition to set upper and lower voltage limits for motor driving so to increase battery life. Omata does not teach or suggest the use of two controls, power supply and torque, that are interrelated and dependent, as claimed in the present application.

Claims 2-4 depend from claim 1, and claims 6-8 depend from claim 5 and are also patentable for the same foregoing reasons.

New claims 10-14 are added to further distinguish Applicant's invention over Omata. All claims are believed not to be in condition for allowance. An early notice to that effect is solicited.

If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and

please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #095309.53124US).

Respectfully submitted,

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